

The True Nature of the Vacuum, the New Ether, Missing Mass, Dark Energy, Black Holes, Casimir Detectors as Vacuum Probes, the Casimir Vacuum Energy Effect on the Speed of Light, and the Evolution of the Universe

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ABSTRACT

These notes outline a new theory about the true nature of the vacuum sea of energy with predictions about black holes, gravity waves, missing matter, dark energy, the Casimir Effect, and the speed of light. The sum of the energies of the various states of the vacuum [a.k.a. tri-vacuum] in an expanding mini-bang multi-vacuum universe is equivalent to the energy of the observable and predicted missing mass and dark energy of the universe. The various states of the vacuum are defined and illustrated. The main assumption of this theory is that the vacuum is not empty but in fact is most of the universe in the form of a deep energy ocean upon whose surface floats all observable matter. The vacuum [empty space] is at least 99.9999999% of the total energy and mass of the universe. This theory shows that the old conventional 'ether' is now the 'surface' of the multi-vacuum [tri-vacuum] or new ether. Methods for testing this theory are outlined including a proposal for a Casimir Vacuum Space [CVS] Detector that can test this theory. The Casimir Detector acts like a vacuum 'pump' on the space between detector plates thus lowering the vacuum energy in this region. It is not really a pump but more like a filter keeping certain photon or particle resonances out of the CVS.

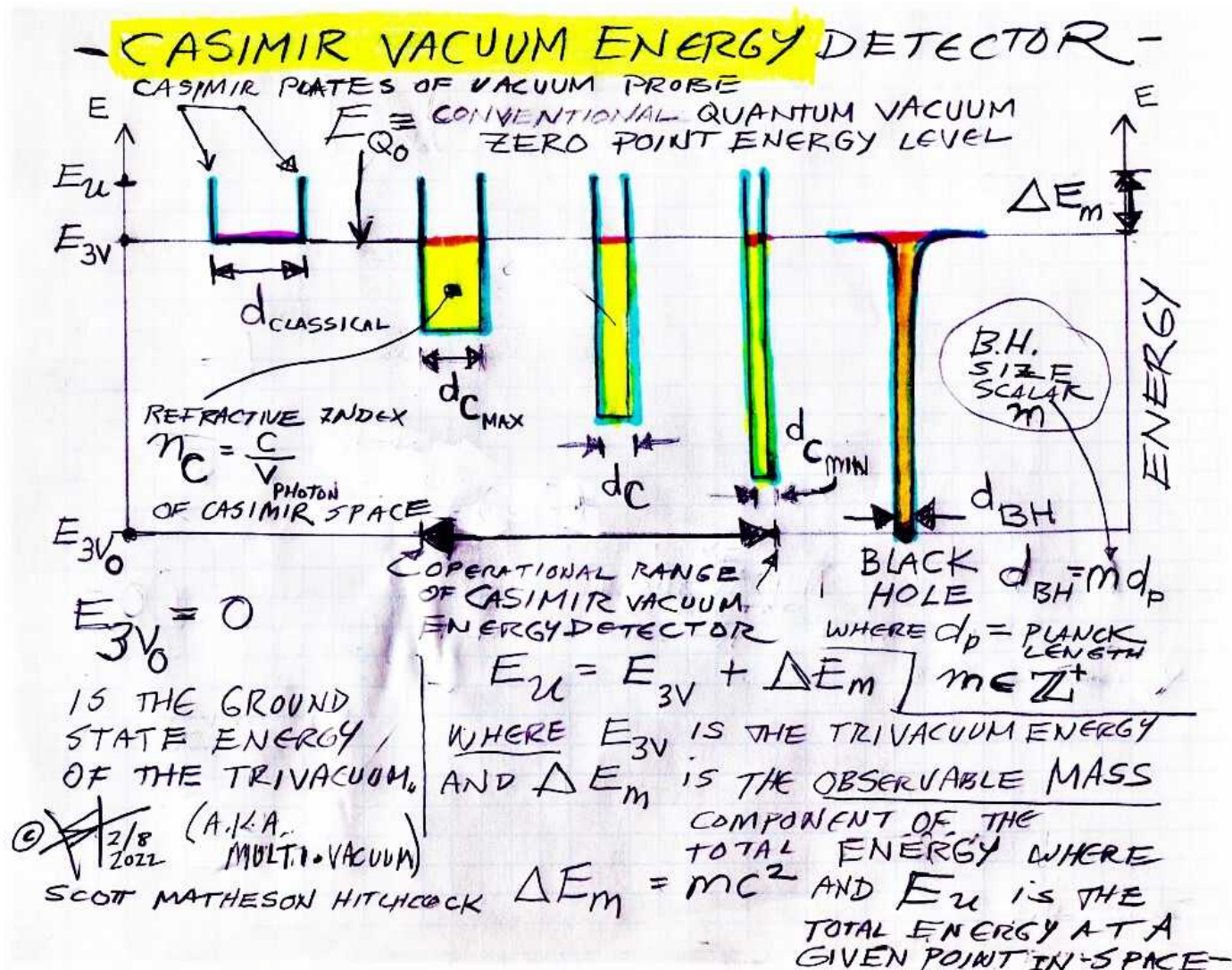


Figure 1: The figure illustrates how the Casimir Effect in the form of a Casimir Detector functions in the context of the tri-vacuum universe with varying distances between the plates of the detector and their effects on the depth of the Casimir Vacuum Space between the plates. Also included is the effect of a black hole on the vacuum. The Casimir Detector can be used to probe the refractive index of the vacuum.

PREFACE

"The physicist of today is a bold guesser; he tries out new hypotheses, even though he has no really conclusive grounds for them. This should not, to be sure, make us fear that physics is a speculative science; for the decision as to whether the physicist's hypotheses should be accepted can only be made much later, according as they are confirmed or not. The physicist is in the fortunate position of being allowed to guess, because he can afterwards ask experience whether his hypotheses are confirmed in all their consequences."

"It is the happy fate of a truly great discovery that it always explains much more than was originally intended. Herein is its character as truth most beautifully revealed; if an assumption is true, it will not only serve the purpose for which it was discovered, but will at the same time involve the roots of all phenomena connected with it"

"The physicist has become a philosopher, because, in developing his theories, he came to barriers which had to be broken open before new and unknown land could be conquered"

- [Hans Reichenbach](#) [from his book "Atom and Cosmos" 1930]

"The scientist who discovers a theory is usually guided to his discovery by guesses; he cannot name a method by means of which he found the theory and can only say that it appeared plausible to him, that he had the right hunch, or that he saw intuitively which assumption would fit the facts."

- [Hans Reichenbach](#), [from his book "The Rise of Scientific Philosophy" 1951]

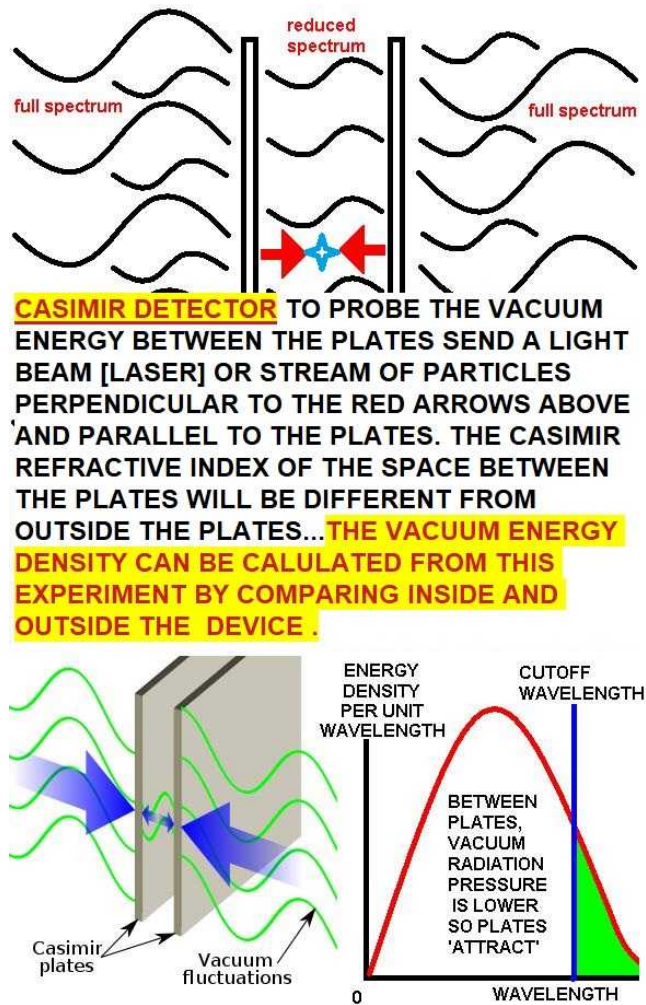


Figure 2. diagram of how a proposed Casimir Detector can establish the Casimir Effect in the vacuum using optical methods to probe the Casimir Vacuum Space inside the detector.

MISSING MASS & ENERGY AS RELATIVE VACUUM LEVELS

(SCOTT M. HITCHCOCK)
[4/27/13 7:52AM EST]

NON-CASIMIR REGION
 $d_{m,m_2} \gg d_p$

CASIMIR DETECTOR
IF: CASIMIR VACUUM
 $d_{m,m_2} = d_{\text{CASIMIR}} = n d_p$

PAGE 1

WHAT WE SEE

[LIGHT] M_{OBS} ≡ OBSERVABLE MASS
[DARK] M, m ≡ MISSING MASS (D.M.)
[DARK] $M.E.$ ≡ MISSING ENERGY

EXPERIMENTAL DESIGNS INCLUDE TEST FOR VACUUM LEVEL TRANSITIONS

EXPERIMENTAL DOMAIN OF PHOTON/PARTICLE SCATTERING & DECAY EVENTS & PHOTON ENERGY SHIFTS

THEN OBS. "VACUUM" PENETRATES INTO "MISSING" MASS & ENERGY DOMAINS

I.E. 3 VAC LEVELS I, II, III

COLOR CODE

OBSERVABLE MASS & ENERGY $|\psi_{m_{\text{OBS}}}\rangle \Rightarrow \text{I}$

MISSING MASS $|\psi_{m_m}\rangle \Rightarrow \text{II}$

MISSING ENERGY $|\psi_{m_e}\rangle \Rightarrow \text{III}$

MULTI-VACUUM UNIVERSE

DISTANCE (UNITS OF PLANCK DISTANCE (LENGTH))
 $d_p = 1.6 \times 10^{-35} \text{ m}$

$|\psi_u\rangle \equiv |\psi_{m_{\text{OBS}}}\rangle \otimes |\psi_{m_m}\rangle \otimes |\psi_{m_e}\rangle$ CURRENT EPOCH

WHERE: $|\psi_{\text{VAC}_{\text{OBS}}}\rangle \equiv |\psi_{m_m}\rangle \otimes |\psi_{m_e}\rangle$ MIXED STATE

* FIRST THOUGHTS: ABOUT MISSING MASS/ENERGY PROBLEM,
MISSING MASS/ENERGY IS EMBEDDED IN VACUUM
WHERE VACUUM HAS AT LEAST 3 STATES (TOPOLOGICAL [X] INTERFACES) DEPENDING ON DISTRIBUTION OF OBSERVABLE MATTER/ENERGY \Rightarrow NOTE GRAVITATION EFFECTS ARE TOPOLOGICAL PROPERTIES OF MULTI STATE VACUUM
 \Rightarrow EXPANSION ACC. OF BIG BANG DUE TO PHASE TRANSITION
ENERGY OF $|\psi_{m_m}\rangle \otimes |\psi_{m_e}\rangle$ DE-COUPLING OF VACUUMS

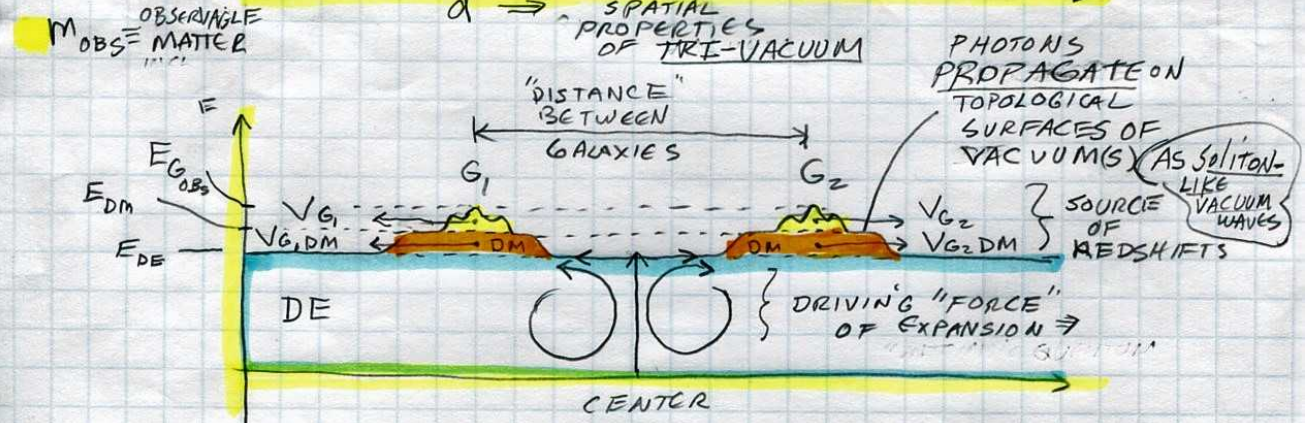
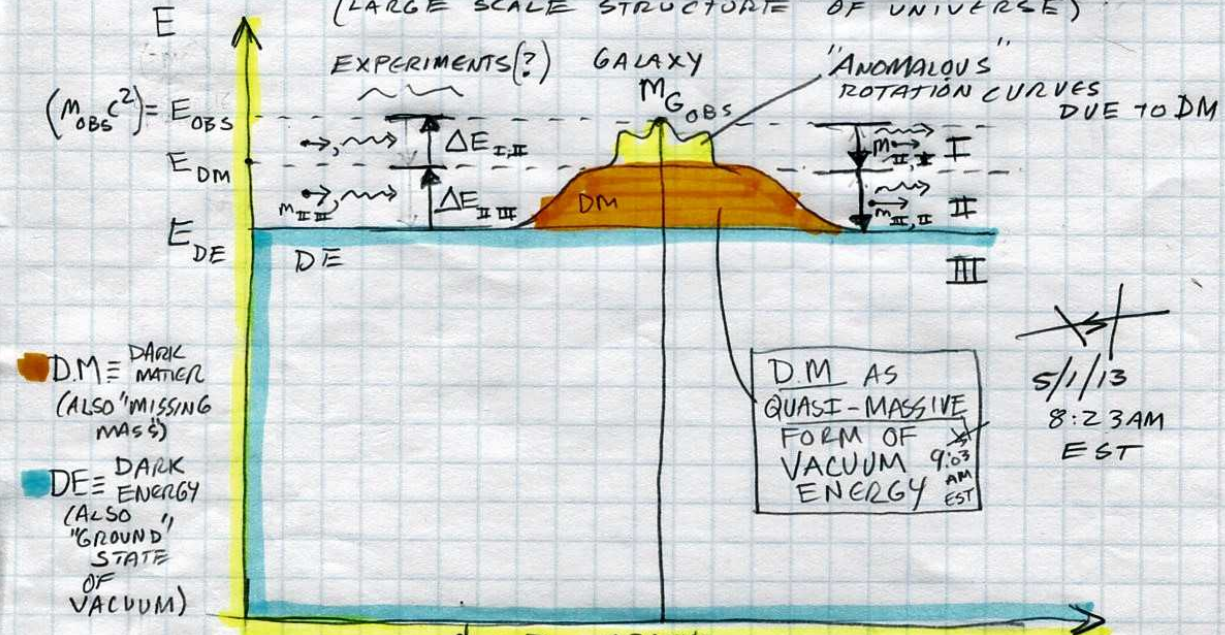
Figure 3: The figure illustrates states of energy of the vacuum that whose phases add up to the space between material objects. Missing mass, dark matter and cosmic expansion energy in the form of vacuum energy are components of the multi-vacuum.

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EVOLUTION OF VACUUM STATES

→ COSMIC PHASE TRANSITIONS OF "VACUUM"
(LARGE SCALE STRUCTURE OF UNIVERSE)



① DM "TRAVELS" WITH M_{OBS}

② BOTH DM & M_{OBS} ARE "PRECIPITATED" →

PHASES "ANALOGOUS" WITH ICEBERGS IN OCEAN

M_{OBS} IS "SOLID STATE" OF DE - ANALOGY

DM IS PHASE TRANSITION BETWEEN DE AND M_{OBS}

ALL "MISSING" MASS AND ENERGY ARE VACUUM COMPONENTS OF THE MULTI-VACUUM UNIVERSE

Figure 4 The figure illustrates how black holes function in the context of the tri-vacuum universe. Note that black holes are not tunnels to another part of the universe but dead ends in the vacuum. Wormholes do not exist in this model due to the quantum nature of the zero point of the vacuum [actual 'location' of the massive core] that is not normally accessible to an observer. Black holes are then topological anomalies in the sea of vacuum energy.

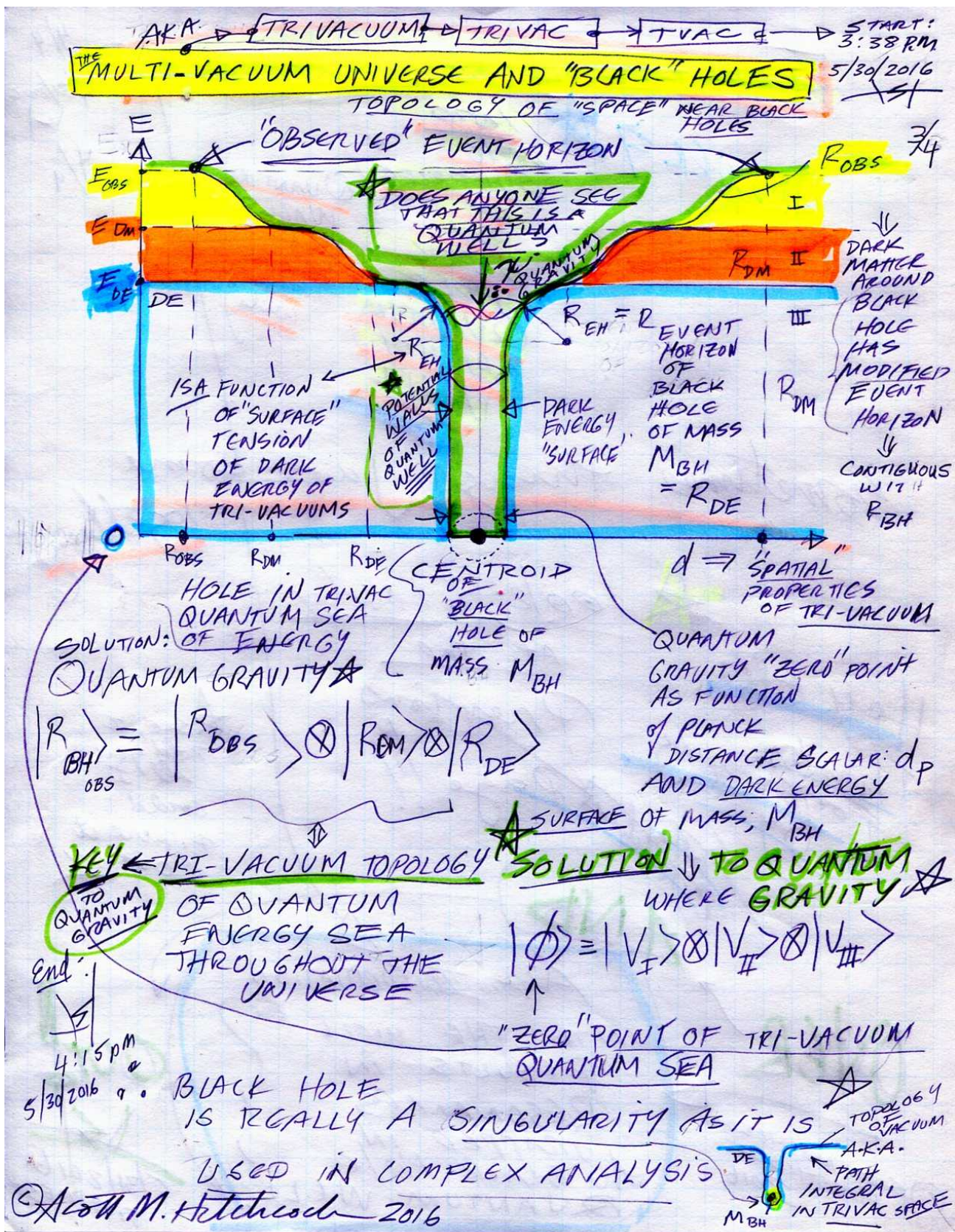


Figure 5: The figure illustrates how a black hole modifies the vacuum. In this theory black hole diameters are quantized in the form of an integer quantum number, k , as a scalar multiple of the Planck Length = $1.616255(18) \times 10^{-35}$ m. We have : $d_{\text{Black Hole}} = k d_{\text{Planck Length}}$. This leads us to a method for determining the nature of quantum gravity and perhaps quantized gravity waves. Black holes are then the zero point energy of the tri-vacuum [multi-vacuum] of this theory.

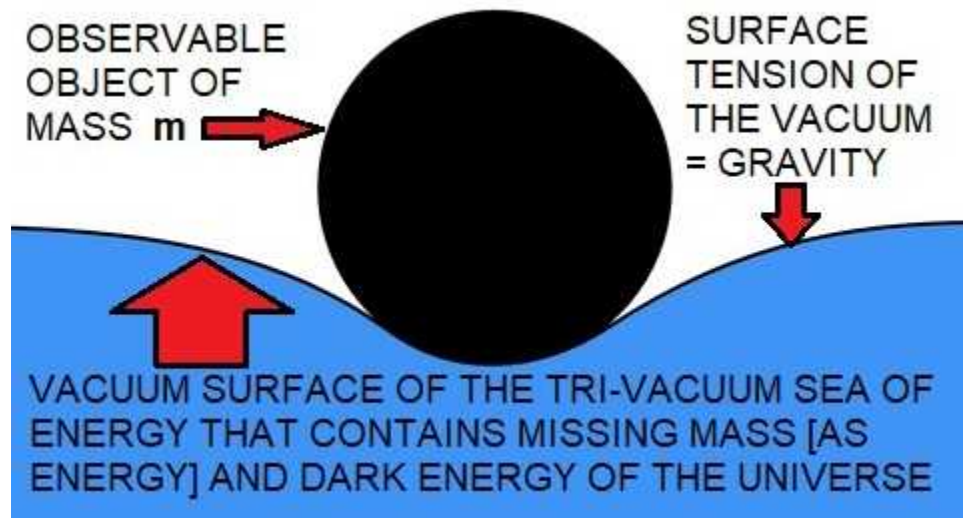


Figure 6: A 2-DIMENSIONAL diagram illustrating a possible map of the surface tension of the vacuum. The 'surface' of the vacuum is in reality a 3-dimensional volume of space surrounding the observable mass of the universe! This diagram is only a map of the concept of a vacuum surface. The theory presented here is *merely a possible map of the physics of the vacuum* and subject to actual experimental verification.

"THE MAP IS NOT THE TERRITORY"- ALFRED KORZYBSKI

A VACUUM COSMOLOGY:

The main assumption of this theory is that the vacuum is not empty but in fact is most of the universe in the form of a deep energy ocean upon whose surface floats all observable matter. The vacuum [empty space] is at least 99.9999999% of the total energy and mass of the universe. The vacuum energy in this theory is not a static medium. It is co-moving with the matter on/in it 3D 'surface' and thus movement through this new ether of energy is not detectible as in the case of the Michelson-Morley experiment.

Lets see where this simple assumption leads us.

The Vacuum energy is an underlying background energy that exists in space throughout the entire Universe. The vacuum energy in conventional physics is a special case of zero-point energy that relates to the quantum vacuum. In the current theory the zero-point energy of the vacuum is illustrated as the surface energy on top of the deep sea of energy remote from matter in deep space. The vacuum energy in this model is not the zero-point energy as it is usually referred to in quantum mechanical descriptions

NATURE DOES NOT ABHOR A VACUUM...NATURE IS THE VACUUM !

This theory is fully testable with various optical techniques such as spectroscopy. another important possibility is use of the Casimir effect to probe the vacuum energy spectrum using lasers or particle streams between two parallel plates with a **quantum scale** [e.g. scalar multiples of the Planck length] separation between the plates. In this model black holes act as Casimir 'detectors' due to the modifications they make to the vacuum energy near the event horizons and inside the black hole surrounding gravitational wells as well as vacuum surface tension.

Matter deforms the vacuum...the curvature of space due to gravitational forces [as in general relativity] is due to the deformation and resulting shape change [topology] of the surface of the vacuum while modifying the *surface tension* around matter as well.

The exclusion of photons perpendicular to the plates in this effect are a demonstration of the ability of a Casimir device [parallel plates made of observable matter] to **lower the vacuum energy and therefore the refractive index between the plates due to the matter-vacuum interaction**.

The deviation of the diffraction pattern [for electrons or photons traversing the Casimir vacuum space between the plates] from that calculated for the **normal vacuum** [where the refractive index is $n=1$] can give a refractive index for the Casimir vacuum space of $n<1$ thus giving evidence for this theory. Using Snell's law we can measure the deviation of a beam by comparing the angles of refraction of the beam inside and outside the Casimir vacuum space. This probe of the Casimir vacuum space can be used to test the non-empty vacuum hypothesis.

According to the theory proposed here, the refractive index, n_{Casimir} , of the **Casimir Vacuum Space [CVS, space between two parallel plates]** should be:

$$n_{\text{Casimir}} = c_{\text{[speed of light]}} / v_{\text{photon}} < 1$$

Which means that the actual speed of a photon traversing the CVS will actually have a velocity greater than the conventional speed of light, c , in the vacuum outside this space.

$$v_{\text{photon}} > c_{\text{[speed of light]}}$$

This is due to the energy level of the vacuum between the Casimir plates being lower than 'normal' vacuum of space. Conservation of energy and momentum for the probe photon or particle with respect to the CVS lowered energy due to matter screening of possible quantum states between the plates leading to a velocity of light in the CVS greater than the speed of light in the normal vacuum [still the vacuum of the deep energy sea of energy]. this can be modeled as a function of the surface tension energy of the vacuum where:

$$E_{\text{Casimir vacuum}} < E_{\text{vacuum}}$$

Note that as the energy in the CVS decreases as a function of the detector plate spacing, the speed of light in this space increases inversely in proportion to the energy drop. Using closely spaced [of the order of the Planck length] ultra dense Casimir plates [made of diamonds or black hole like material ???], **the speed of light might become infinite especially around a black hole.**

This proposed probe of the CVS can be used to test the non-empty vacuum hypothesis and vacuum energy modifications due to mass-vacuum interactions.

From the definition of the refractive index for the conventional vacuum we have:

$$\begin{aligned} n_{\text{[conventional vacuum]}} &\equiv 1.000 \\ &= c_{\text{[speed of light conventional vacuum]}} / v_{\text{[actual photon speed]}} \end{aligned}$$

If a photon [according to the new theory presented here] is inside [within the Casimir limits see fig. 1] the complex tri-vacuum [a.k.a. multi-vacuum] gravitational 'well' of a black hole [B. H.] where the vacuum energy collapses around the black hole. Then the refractive index of the tri-vacuum in this theory is defined to be zero at the black hole:

$$\begin{aligned} n_{\text{B.H.. [tri-vacuum]}} &\equiv 0.000 \\ &= c_{\text{[speed of light conventional vacuum]}} / v_{\text{[actual photon speed]}} \end{aligned}$$

This means that in the black hole well the speed of the photon speed goes to infinity [relative to the standard speed of light in the conventional vacuum model] until it is absorbed and annihilated out of existence:

$$v_{\text{[actual photon speed in a black hole well]}} \Rightarrow \infty$$

An interesting property of the vacuum around black holes is that the refractive index of the vacuum goes to zero which means that the speed of light would go to infinity as photons fall into the black hole region!

Note 0 As the universe expands and ages, the observable matter [particles and their energies] may decay [i.e. the light sources such as stars etc. in the universe will go out and all the fundamental particles may decay into photons] the islands disappear back into the vacuum energy of the future state of empty space. As the universe gets stretched to a maximum thinness the surface tension of the vacuum may cause the vacuum to go through a phase where the tension constrains the expansion that could 'pop' [like a bubble] into a new universe state [true nothingness?], cause a reversal of expansion, remain in a steady state halting expansion, or just continue expanding to the elastic limit of the vacuum sea of energy perhaps only populated by vacuum surface waves [other solitons like gravity waves] in the form of photons that have no matter to collide and interact with.

These three components of the vacuum are the reservoirs of missing mass, dark energy, and the observable universe. All these add up to the total energy available for the evolution of the universe. In this way all of the mass and energy of the universe can be accounted for resulting in an explanatory paradigm effective for cosmological inquiries.

If you are looking for the missing mass and energy locally at the macroscopic scale of our body which is 99.9999999% "empty space" punctuated by atoms that make up our form. the multi-vacuum space between all the atoms as proposed in this theory is only empty from our limited point of view. Our point of view is that of a sailor on a boat looking 'over' a vast ocean whose depth is unknown and not readily determined from the surface.

This means that the vacuum component [empty space] is at least 99.9999999% of the total energy and mass of the universe.

Note 1: The properties of the vacuum illustrated in these sketches are consistent with the [mini-bang theory of the bubble universe](#) and the many multi-vacuum and multi-phase properties of space [the vacuum] that predicts [remnants in the form of black holes may be found at the centers of the cosmic voids](#) [see [Figure 7](#)] as relics of the expansion of the universe resulting from the cumulative effects of many min-bangs acting together to expand the vacuum and therefore what we call the space of space-time models. Dark matter and dark energy

or missing mass and cosmological hidden energy resulting in the big bang and its variants explain the various expansion rates at various epochs.

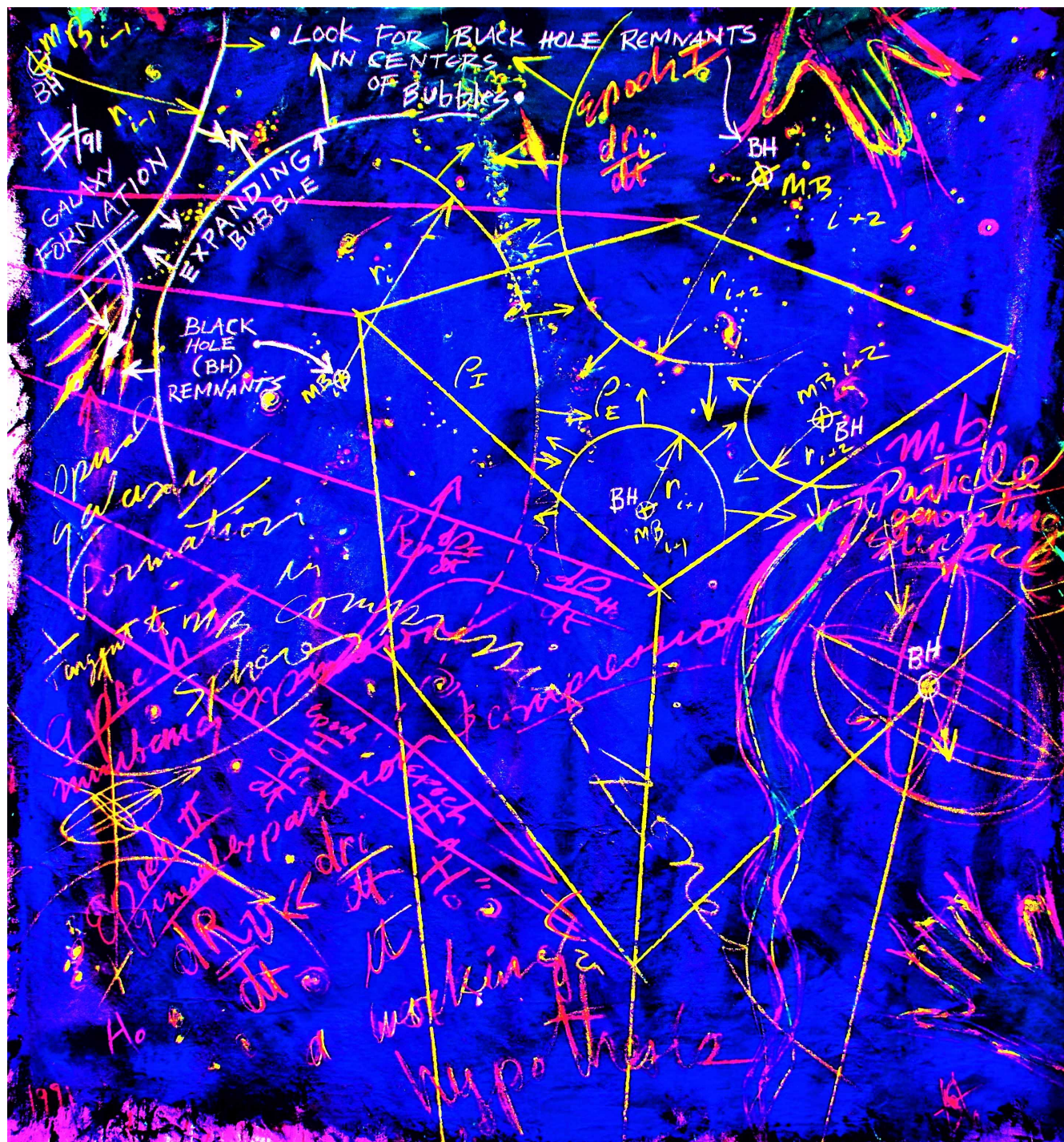


Figure 7: an artists conception of the the **mini-bang theory** of galaxy distributions and black hole remnant in cosmic voids or bubbles

* The speed of light on the vacuum surface in my multi-vacuum universe model is finite due to the fact that photons represent wave motion on the surface of the vacuum energy much like the variations in the speed of light transmission in observable media such as optically clear solids, liquids, and gases due to the refractive index. The possibility of tachyon-like [ftl: faster than light] behavior of a photon in the Casimir vacuum space near black holes may exist and can be verified by the experiments described here.

An interesting property of the vacuum around black holes is that the refractive index of the vacuum goes to zero which means that the speed of light would go to infinity as photons fall into the black hole region!

Gravitational lensing near observational matter occurs due to the refractive index of the energy field of the vacuum modified by variations in the vacuum energy density near matter. The path of photons are deflected by energy density gradients of the vacuum resulting in photon

paths deviating from the free [linear] trajectories without influences due to gravity. The bending of light near the matter-vacuum interface can result in the relative 'slowing down' of photons as is well known in macroscopic optical media. At the macroscopic and quantum scales one can design optical experiments to test this hypothesis by mapping photon trajectories near matter.

Diffraction and interference of light due to interactions of photons [i.e. soliton wave packets] with matter may be viewed in this theory as the result of the variation in the refractive index of the vacuum energy throughout space. Photons passing near matter whose trajectories are 'bent' or lensed can be accounted for by the repulsive or attractive energy density nature of the vacuum due to the distribution of matter condensates. Young's double slit experiment creates patterns of that are wave patterns of the vacuum energy. Diffraction patterns map the vacuum energy and provide a useful method to test this theory by successive measurements of the patterns created as passing photons get closer and closer to diffractive matter. Optical devices using lasers can be used to probe the vacuum energy and help test this theory. Other tests may be imagined using fundamental particle interactions in accelerators.

** The medium of vacuum energy can only support the finite speed of light velocity due to its surface tension limiting wave motion of the energy of space except near massive objects such as black holes.

*** This multi-vacuum model is similar to *fluid models* where the elastic limit of propagation speed of surface waves on these fluids such as water. **The energy of the vacuum is defined as a fluid of energy [not merely a restatement of old models of an empty 'ether'...see Appendix 1 but a 'new' ether theory based on a deeper understanding of the true nature of the vacuum]** upon its surface all matter resides. The speed of light, **c**, is a fundamental intrinsic property of the multi-vacuum universe. The vacuum surface topology is **active** with wave and matter interactions that we 'see' as the observable universe.

The complex structure of the vacuum in this theory is not an **ether** since it is not a propagating medium for photons in the sense of a gas or some other material [matter] as in optical solids. The [Michelson–Morley experiment](#) that gave a null result for our velocity through the **ether** is not contradicted here since the vacuum is a surface upon which solitons like photons and gravity waves move without velocity changes due to the motion of sources and detectors unless near massive objects such as black holes.

**** Photon interactions with matter are the interactions of the wave nature of the surface of the vacuum with the islands of precipitates we observe as matter with mass. The photons are similar to other soliton wave packets such as gravity waves in that they are perturbations of the vacuum surface that when their energy exceeds the surface tension energy they can precipitate observable matter that remains on the surface of the vacuum similar to quantum fluctuations of the old empty vacuum models.

***** Photons become evident in spectroscopy as they become observable through their detection [absorption, collapse of the wave function, or decay modes] through interaction with the matter constituting our scientific devices.

Photons are vacuum surface solitons.

Solitons are waves with just a single crest. They result when a wave's natural tendency to spread as it propagates is canceled out by an inherently nonlinear phenomenon known as [self-focusing](#).

In mathematics and physics, a soliton or solitary wave is a self-reinforcing wave packet that maintains its shape while it propagates at a constant velocity. Solitons are caused by a cancellation of nonlinear and dispersive effects in the medium. (dispersive effects are a property of certain systems where the speed of a wave depends on its frequency.) Solitons are the solutions of a widespread class of weakly nonlinear dispersive partial differential equations describing physical systems.

The soliton phenomenon was first described in 1834 by John [Scott Russell](#) (1808–1882) who observed a solitary wave in the union canal in Scotland. he reproduced the phenomenon in a wave tank and named it the "wave of translation".

This means that solitons can travel a long distance whilst maintaining their same shape. The soliton nature of these vacuum waves allows these photons to 'hold together' throughout their journey through space as in the case of light from distant galaxies.

The wave packets in the form of photons propagate on the surface of the vacuum in the same way as solitons on water. The vacuum surface waves are proof that the energy of the vacuum exists and acts like a medium for the propagation of waves such as photons.

The enormous depth of the energy of the vacuum allows the photons to hold together since the amplitude of photon wave packet solitons is extremely small compared to the energy of the vacuum medium. **Photons can be used to probe the nature of the vacuum energy.**

The nature of the vacuum surface, vacuum noise, and expansion of the universe

Lets look at the physics of the vacuum surface and its interactions with matter. It is proposed here that the surface of the deep sea of vacuum energy is **noisy** at the microscopic [quantum] level. This noise is due to the quantum fluctuations predicted and observed resulting from uncertainty of the energy that is known to produce [virtual particles](#) [e.g. pair production etc.] that 'decay' back into the multi-vacuum surface energy within the time scale defined by the Heisenberg time-energy uncertainty relation. This ongoing noisy process of virtual particle creation and destruction demonstrates that the vacuum is truly not 'empty'. The constant quantum turbulence of the surface topology gives rise to universal cosmic noise in where the identities of individual fluctuations act as [collective excitations](#) and represent possible sources of the **cosmic 3K background radiation**.

The noise from surface fluctuations of the vacuum energy can take many forms including thermal noise in aggregations of matter. This noise is observable in many forms such as those found in the electromagnetic spectrum and the instruments used to detect signals from sources of increasing hierarchical complexity from the quantum thru macroscopic to cosmic scales. Signals can arise from various photon-matter

interactions such as photon absorption and emission from electrons around atoms which can be observed with techniques such as spectroscopy. These observable processes create signals that carry information to our instruments where the detected signals are interpreted by the observer after taking noise into account.

The noise from the surface of the vacuum energy increases the entropy of universe through its expansion as the sea of energy propels the inflation of the universe in models such as the big bang. The properties of the vacuum energy surface lead to **red-shifts** and **blue-shifts** in photon signals due to moving matter sources and the conservation of wave-packet photon/soliton shape as they travel across the surface of the vacuum.

Vacuum energy noise supports and creates change in the material configurations of the observable universe at all scales of size. It is the vacuum energy 'surface' upon which the fundamental interactions [strong and weak nuclear, electromagnetic and gravitational] forces leading to a **Grand Unification Theory [GUT] where they can be seen as united by the common term of **time created by information** produced during changes in the configurations of matter in the form of signals used to construct maps of change with **our brains T-computer**. The unification of the fundamental interactions via the **time concept** allows us to understand **cosmological time** generated by **process of information creation** in the universe at large.**

Vacuum noise causes change.

Vacuum noise along with other signals [e.g. ionizing radiation and destructive particle collisions] propagating across the surface of the sea of energy produce changes in the configurations of matter so that evolution of these matter islands of the vacuum can occur. These interactions of the vacuum noise and vacuum energy with matter can lead to *mutations* such as those seen in DNA. this is why biological systems can evolve through variants in the genome programmed by various DNA mutations.

Vacuum noise is the cause for the limitations of measurement at the quantum level as stated in [Heisenberg's uncertainty relations](#) => namely the momentum-position and energy-time rules:

$$\Delta p \Delta x \geq \hbar/2$$

$$\Delta E \Delta t \geq \hbar/2$$

Vacuum noise limits our ability to be deterministic or have absolutely precise measurements of causally related events leading to probabilistic and statistical descriptions of the observable events that define the basis of physics.

Vacuum noise [a topological feature of the surface tension of the vacuum on top of the deep sea of energy in the illustrations] is the source of the fundamental limitations of physics to 'know' anything with absolute precision.

The vacuum noise barrier at the quantum scale extends to the cosmic scale in limiting our knowledge of reality

What is the source of the vacuum noise proposed in this theory?

Possible vacuum noise sources or causes are listed below:

1. **Vacuum traffic noise** from particle collisions and other reversible and irreversible interactions between observable vacuum surface objects such as cosmic rays, fundamental particles, atoms, mass concentrations such as dust, meteoroids, asteroids, planets, stars, black holes, galaxies, and clusters of galaxies and dark matter [not vacuum components]. Interference between wave packets in the form of vacuum solitons in the forms of photons, gravity waves, electromagnetic radiation fields, gravitational fields and dark matter and energy [components of the total vacuum energy]. Superposition of all the waves and particles in all the directions throughout the universe contributes to the vacuum surface [3d space not a 2d flat surface] topological graininess
2. **Vacuum surface turbulence** such as quantum eddy currents, energy vortexes, nucleation and matter precipitation sites at topological defects or anomalies around black holes.
3. **Signals from noise and noise from signals quantum fluctuations and surface perturbations** of the vacuum sea of energy intrinsic to the expansion of the material universe. Interactions of the vacuum [noise] with signals [observable material precipitates] in an ongoing process of cosmic evolution.
4. **Bandwidth** of the vacuum noise varies locally with matter interactions producing cosmic expansion noise superimposed on quantum vacuum noise to give rise to complex structures of noise in and around mass concentrations and defining vacuum noise as a function of position in space.
5. **Cosmic microwave background [CMB] radiation 3K** is a fundamental noise of the vacuum. The energy density of the CMB is 0.260 eV/cm³ (4.17×10⁻¹⁴ J/m³) which yields about 411 photons/cm³. These photons throughout the universe create an almost homogeneous photon noise permeating the vacuum. The CMB has a thermal black body spectrum at a temperature of 2.72548 ± 0.00057 K.[5] the spectral radiance peaks at 160.23 GHz, in the microwave range of frequencies, corresponding to a photon energy of about 6.626 X 10⁻⁴ eV. the peak wavelength is 1.063 mm (282 GHz, 1.168 X 10⁻³ eV photons). The glow is very nearly uniform in all directions, but the tiny residual variations show a very specific pattern, the same as that expected of a fairly uniformly distributed hot gas that has expanded to the current size of the universe. In particular, the spectral radiance at different angles of observation in the sky contains small anisotropies, or irregularities, which vary with the size of the region examined. They have been measured in detail, and match what would be expected if small thermal

variations, generated by quantum fluctuations of matter in a very tiny space, had expanded to the size of the observable universe we see today. In this sense the photons are contributions to the 'thermal' noise in the 'surface' of the vacuum.

Other possible sources or causes of vacuum noise? ... further inquiry is needed!

Note 2: Myths in Physics: such as time travel, space-time, wormholes, tachyons, the one electron universe, and teleportation [beaming] are negated in the theory presented here. All of these popular physics myths lead to wrong theories that persist in the science community despite a complete lack of evidence. In the authors model presented here, tachyons are only a transient state of a photon passing through a Casimir detector near a black hole if they exist at all!

Note 3: The sum of the energies of the various states of the vacuum in a multi-vacuum universe is equivalent to the energy of the observable and predicted missing mass and energy [expansion energy] of the universe.

See [Feynman clocks, the vacuum, gravity waves, and time](#)

In the multi-vacuum universe model of the universe first proposed by this author, the three phases of the vacuum act as a collectively as a composite structure that defines space in which all the missing mass and dark energy reside as well as many other quantum, macroscopic, and cosmic properties. One of the properties of the collective excitation vacuum state is that it defines space. We find that this nearly infinite sea of vacuum energy [>99 % of the mass of the universe as a whole] has a surface that separates and uniquely isolates observable distinct matter [such as us] as objects floating on the surface of the sea of vacuum energy.

We have the following general statement about the total energy of the universe in relation to the total energy of the vacuum [including vacuum surface tension energy] and the total observable mass. This total energy of the universe drives the dynamics of matter and the shape and size of the vacuum through the big bang expansion. It is likely that the overall energy of the universe is conserved in spite of an apparent increase in the total entropy. The total energy-mass equivalency for the universe is modeled following from Einstein's equation where:

$$E_{\text{universe}} = E_{\text{vacuum}} + E_{\text{observable mass}} = [m_{\text{vacuum}} + m_{\text{observable}}] c^2$$

For more about the complex nature of the vacuum and its surface as a vehicle for photons, gravity waves, and cosmological expansion see the captions for the illustrations above inside the following paper:

[The Surface Tension of the Universe](#)

Since [time](#) is intimately connected to the nature of the vacuum via the changes and evolution of observable matter [the vacuum is usually assumed to be the space in space-time models], It is useful to examine the following:

[What Time is and What Time is Not](#)

See also [Hans Reichenbach and the causal theory of time](#) for more about the nature of time.

Also relevant is [Richard p. Feynman's 1949 paper "The Theory of Positrons" Phys. Rev. 76, 749 – published 15 September 1949](#) [see Feynman's paper about positrons and time reversal...now shown to be false due to errors in the assumptions and understanding of the nature of time in space-time models. This lack of understanding leads one away from finding the true nature of time. For more details about the failure of Feynman's time-reversal hypothesis see the following paper:

[The Theory of Positrons* revisited by Scott Matheson Hitchcock](#)

Conclusions: by assuming a non-empty vacuum many cosmological questions have new answers to examine and investigate. We see that gravity and photons could be surface tension features of a complex vacuum that contains missing mass and dark energy. gravity waves like photons are then surface waves or solitons of the vacuum in this model. Black holes are singularities [quantum perturbations with diameters on the order of the Planck length] of the vacuum sea caused by mass distorting the vacuum energy.

Vacuum noise due to the **active nature of the vacuum** surface following the time-energy Heisenberg uncertainty principle can propel the evolution of the universe and all things in it. Vacuum noise might be the source or cause of the fundamental limitations of Heisenberg's uncertainty principles.

This theory is fully testable with various optical techniques such as spectroscopy. Another important possibility is use of the Casimir effect to probe the vacuum energy spectrum using lasers or particle streams between two parallel plates with a quantum scale [e.g. scalar multiples of the Planck length] as a function of the separation between the plates .

The exclusion of photons perpendicular to the plates in this effect are a demonstration of the ability of a Casimir device [parallel plates made of observable matter] to lower the vacuum energy between the plates due to the matter-vacuum interaction.

Based on the theory presented here, it is predicted that the speed of light between Casimir plates **may** be faster than the speed of light, *c*, of the conventional vacuum...this can be verified or nullified by experiment\

BIBLIOGRAPHY:

- *See the underlined links to the various sources and specific papers throughout this paper.*

APPENDIX:

[1] The **ether** also spelled **aether**, also called **luminiferous ether**, in physics, a theoretical universal substance believed during the 19th century to act as the medium for transmission of electromagnetic waves (e.g., light and X-rays), much as sound waves are transmitted by elastic media such as air. The ether was assumed to be weightless, transparent, frictionless, undetectable chemically or physically, and literally permeating all matter and space. The theory met with increasing difficulties as the nature of light and the structure of matter became better understood. It was seriously weakened (1887) by the **Michelson-Morley experiment**, which was designed specifically to detect the motion of Earth through the ether and which showed that there was no such effect. (Ether theories were also used to explain gravity beginning in the 17th century, but they did not have the popularity of those explaining the propagation of light.) With the formulation of the special theory of relativity by Albert Einstein in 1905 and its acceptance by scientists generally, the ether hypothesis was abandoned as being unnecessary in terms of Einstein's assumption that the speed of light, or any electromagnetic wave, is a universal constant.

In an astonishing twist of fate, the key to relativity's salvation could lie in the **aether**. Since the early 2000s, a small group of researchers have claimed that this invisible, **space-filling substance** could have the power to unify physics. Then, in late 2018, two independent groups suggested that the similarity between the aether and the shadowy powers that populate our cosmos may not be mere coincidence. For one team, **the aether is a dead ringer for dark matter. For another, it could explain away dark energy. For others [this author] still, it might even be both or more as in the case presented in this paper!**